

EXPERIMENTAL AND NUMERICAL SIMULATION OF A HYPERSONIC AIR INTAKE FOR SCRAMJET ENGINE AND COMPARISON WITH FLIGHT PERFORMANCE

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Abstract

During the design and development phase of the scramjet engines, the aerodynamic performance of the air-intake was characterized by wind tunnel tests and numerical simulations. The details of the experimental and numerical studies carried out and their results are presented in this paper. Experiments were carried out at Mach 6 for 1:1 and 1:5 scale air-intake models and 1:6.5 scale down model intake with fore-body. The air-intake performance is quantified through pressure recovery for different blockages. Wall static pressure on the ramp is measured and found to be good match with the CFD prediction. In order to understand the flow field in the duct both Schlieren and oil flow visualization were captured. The match between the pre-flight predictions and the flight measured data is reasonably good.

Keywords: Scramjet Flight Demonstrator, Air Intake Performance, Hypersonic Wind Tunnel, Numerical Simulations